6 Discussion of Results and Conclusions

The ISWS data at Goose Island trip 2 show that for vessels that appear similar in all respects, the scatter in the data is large. The standard deviation of the observed return velocity averaged 34 percent of the return velocity for data that were taken at one cross-section at one flowrate and by velocity meters placed in the channel and left in their initial position. If the variability resulting from other flows, other cross-sections, other meter placement, and other velocity meters is introduced, the scatter becomes quite large. The deviation of observed versus computed return velocity and drawdown also arises from factors not used in NAVEFF, such as the skewness of the tow. The difficulty of extracting the vessel influence from ambient deviations will always contribute heavily to the scatter in the data.

Examination of the ISWS data presented in the scatterplots and the MTE shows that the NAVEFF model for return velocity tends to over predict by an average of 29 percent when all data are considered. The NAVEFF model for drawdown tends to over predict by an average of 40 percent when all data are considered. Concern about this amount of over prediction of drawdown should be tempered by the fact that the accuracy of the wave gage (stated as 0.015 m) is a substantial percentage of many of the drawdown measurements, such as those on Apple River (average drawdown = 0.04 m) and Goose Island (average drawdown = 0.03 m).

Examination of the individual tow event plots shows that the exponential decay function correctly fits the shape of the observed data in the majority of the tow events. This is particularly evident in the ISWS Goose Island Trip 1 and 2 plots where a large number of velocity meters extend over a 200 m width of the channel. Since drawdown data were only collected at one wave gage near the shoreline, additional data are needed to verify the distribution of drawdown between shoreline and vessel.

Examination of the WES UMRS data show that the NAVEFF model for return velocity tends to over predict by an average of 25 percent when all data are considered. The NAVEFF model for drawdown tends to over predict by an average of 15 percent when all data are considered. The error measures used herein are subject to a significant influence from data where the observed value is low and the calculated value is high. Removal of outliers (2 of 23 points in return velocity, 3 of 47 points from drawdown) from the data reduced the average over prediction of return velocity to 13 percent and of drawdown to 1 percent. Similar

reductions in the error measures of the ISWS data would be expected by removal of outliers.

Examination of the GIWW data presented in the scatterplots and the MTE shows that the NAVEFF model for return velocity tends to over predict by about 25 percent. The NAVEFF model for drawdown tends to under predict by about 23 percent. The GIWW data were the only drawdown data suggesting significant under prediction by NAVEFF.

Examination of the Tothill (1966) data for ship squat in a confined channel show that maximum water level drawdown from the NAVEFF model provided a fair estimate of the average ship squat with an average over prediction of 18 percent.

The data presented herein show that the NAVEFF model tends to over predict return velocity by 25-29 percent when considering all data. The data presented herein for drawdown are mixed, with the ISWS showing an average over prediction of 40 percent, the WES UMRS data showing 15 percent, and the GIWW data showing an under prediction of 23 percent. Based on all of the comparisons of drawdown, the writer concludes that the over prediction of drawdown is no more than the 25-29 percent demonstrated by the return velocity over prediction. The overprediction of both return velocity and drawdown is probably less if the exaggerated influence of outliers is removed from the error measures.

Based on these comparisons and the need for some conservatism in parameters that are so difficult to measure, NAVEFF as presented in Maynord (1996b) is recommended for estimating return velocity and drawdown. Additional comparisons to ship squat data are needed before conclusions can be drawn regarding the applicability of NAVEFF.